

REMARKS

The Final Office Action of May 12, 2005, has been received and reviewed.

Claims 1-88 are currently pending in the above-referenced application. Of these, only claims 1-17 have been considered, claims 18-88 having been withdrawn from consideration pursuant to a species election requirement. Each of claims 1-17 stands rejected.

Reconsideration of the above-referenced application is respectfully requested.

Rejections Under 35 U.S.C. § 102

Claims 1, 2, 8, 9, 11, 16, and 17 stand rejected under 35 U.S.C. § 102(e) for reciting subject matter which is purportedly anticipated by the subject matter described in U.S. Patent 6,278,153 to Kikuchi et al. (hereinafter “Kikuchi”).

A claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single reference which qualifies as prior art under 35 U.S.C. § 102. *Verdegaal Brothers v. Union Oil Co. of California*, 2 USPQ2d 1051, 1053 (Fed. Cir. 1987). The identical invention must be shown in as complete detail as is contained in the claim. *Richardson v. Suzuki Motor Co.*, 9 USPQ2d 1913, 1920 (Fed. Cir. 1989).

The plain language of a reference constitutes its express description. With respect to illustrations, M.P.E.P. § 2125 provides that “[d]rawings and pictures can anticipate claims if they clearly show the structure which is claimed,” but cautions that the “drawings must be evaluated for what they reasonably disclose and suggest to one of ordinary skill in the art.” M.P.E.P. § 2125 indicates, as an example, that the relative dimensions of features of an object illustrated in drawings would not be reasonably disclosed or suggested to one of ordinary skill in the art unless the reference also discloses that the drawings are to scale.

M.P.E.P. § 2112 explains the inherent description provided by a reference as follows:

The fact that a certain result or characteristic may occur or be present in the prior art is not sufficient to establish inherency of that result or characteristic. *In re Rijckaert*, 9 F.3d 1531, 1534, 28 USPQ2d 1955, 1957 (Fed. Cir. 1993) . . . ‘To establish inherency, the extrinsic evidence ‘must make clear that the missing descriptive matter is necessarily present in the thing described in the reference, and that it would be so recognized by persons of

ordinary skill . . .” *In re Robertson*, 169 F.3d 743, 745, 49 USPQ2d 1949, 1950-51 (Fed. Cir. 1991).

Kikuchi shows, in Fig. 6D, an intermediate semiconductor device structure in which a layer of resist 20 has been disposed within and over a via-hole 23a. Kikuchi also discloses that the resist 20 can be applied by several conventional methods, including spin-coating. Col. 17, lines 63-66.

While resist 20 *appears* in Fig. 6D of Kikuchi to have a planar surface, Kikuchi lacks any express or inherent description that the surface of resist 20 is actually planar.

Independent claim 1 recites a method for disposing a material on a semiconductor device structure. In the method of independent claim 1, material is disposed on a surface of a semiconductor device structure “so as to substantially fill . . . at least one recess [thereof, the] material covering [the] surface having a thickness less than a depth of said at least one recess . . .” A material layer with these characteristics is formed “without subsequently removing [the] material from [the] surface . . .” Independent claim 1 also requires that “an upper surface of at least a portion of said material over or within said at least one recess [be] substantially planar.”

There is no need for a quantifiable dimensional range for the phrase “substantially planar” in independent claim 1 since one of ordinary skill in the art would readily understand the meaning of the phrase “substantially planar” in reference to the planarity of the upper surface of a particular type of material that has been disposed within or over a recess of a semiconductor device structure. *See, e.g.*, M.P.E.P. § 2173.05(b).

It is respectfully submitted that Kikuchi does not anticipate a method that includes disposing material in such a way that “an upper surface of at least a portion of [the] material over or within . . . at least one recess [is] substantially planar.”

While it has been asserted that Fig. 6D of Kikuchi shows a layer of resist 20 which *appears* to have a planar surface, it is respectfully submitted that Kikuchi, in fact, lacks any express description that the surface of resist 20 is planar. A high standard has been set for reliance on drawings in prior art rejections. In view of the warning that has been provided by M.P.E.P. § 2125 with respect to reliance upon the drawings of a patent, and without further

guidance from the specification of Kikuchi, the mere inclusion of a straight line to depict the surface of resist 20 does not adequately indicate that surfaces represented by the straight lines are substantially planar. Thus, Kikuchi does not expressly or inherently describe that any portion of the surface of resist 20 or, more specifically, that the surface of the portion of resist 20 that is over or within recesses, is substantially planar.

Moreover, Kikuchi includes no express or inherent description that the thickness of portions of the resist that cover the surface of the illustrated semiconductor device structure are less than a depth of at least one resist-filled recess therein. As has been established, the drawings of Kikuchi are merely simplified representations that cannot be relied upon to support the assertion that Kikuchi discloses a particular thickness of resist over a semiconductor device structure relative to the depth of a recess in the semiconductor device structure.

It is also respectfully submitted that Kikuchi lacks any inherent description that the method described therein results in a layer of resist 20 that includes a portion over or within a recess with a planar surface. As would be readily apparent to those of ordinary skill in the art, it is clear that the conventional spin-on processes and photoresist material employed in Kikuchi do not necessarily result in a planar surface on resist 20 which is disposed over or within via-holes 23a. As pointed out by the “Background” section of the specification of the above-referenced application, at page 3, line 15, to page 4, line 29, the limitations in previously known spin-on methods, as well as material properties (e.g., viscosity, solids content, surface tension, adherence to adjacent materials, etc.), may prevent a layer of material, such as the resist 20 disclosed by Kikuchi and illustrated in Fig. 6D, from having a substantially planar upper surface. *See, e.g.,* Van Zandt, P., Microchip Fabrication – Chapter 8, Photolithography—Preparation to Exposure, pages 176-178 and 185-187 (hereinafter “Van Zandt”). Further, Van Zandt, at page 185, evidently recognizing that a spun-on layer of photoresist will include valleys that are located over recesses in a semiconductor substrate, describes spun-on photoresist in terms of *layer* thickness (e.g., 0.5 μm to 1.5 μm thick, with variations of $\pm 0.01 \mu\text{m}$) rather than in terms of surface planarity. U.S. Patent 6,117,486 to Yoshihara (hereinafter “Yoshihara”) provides further evidence that the surfaces of spun-on photoresist layers may not be planar. Yoshihara, col. 1, line 18, to col. 2, line 17).

Based on the aforementioned background art, coupled with the law relating to anticipation and Kikuchi's aforementioned deficiencies, no speculation or misconstruction of the disclosure of Kikuchi is necessary to state that Kikuchi lacks any express or inherent description of a method that includes disposing resist 20 on a surface of a semiconductor device structure 21 such that the resist 20 over or within a via-hole 23a thereof has an upper surface which is substantially planar. Rather, it is the Office's assertions that Kikuchi does anticipate such subject matter that are based on mere speculation as to the nature of the surface of resist 20 over or within via-holes 23.

For these reasons, it is respectfully submitted that Kikuchi does not anticipate each and every element of independent claim 1, as is required to maintain a rejection under 35 U.S.C. § 102(e). Thus, under 35 U.S.C. § 102(e), independent claim 1 is allowable over Kikuchi.

Claims 2, 8, 9, 11, 16, and 17 are each allowable, among other reasons, as depending either directly or indirectly from claim 1, which is allowable.

Claim 2 should be construed in accordance with its plain language, as well as the equivalents thereto, and should not be limited to the examples of structures shown in Figs. 2 and 3 of the above-referenced application.

Claim 2, which is rejected as being anticipated by Figs 6A-6E; 10A-10E; 13A-13E, is further allowable since none of these figures shows "disposing [a] material . . . so as to substantially fill . . . at least one recess *without substantially covering [a] surface of a semiconductor device structure . . .*" While the various figures that have been referenced in support of this assertion, including Figs. 6E, 10D, 10E, and 13E of Kikuchi, show structures which include recesses that are substantially filled with material while the same material does not cover the surfaces of the illustrated semiconductor devices, these structures are not formed while *disposing* material. Rather, Kikuchi describes that conventional resist application techniques are used, then, after *disposing* the resist, *removing* excess resist by *another, subsequent process*. For example, etchants may be used in the conventional processes described in Kikuchi to remove excess material (col. 18, lines 3-5; col. 26, lines 19-21; col. 40, line 66, to col. 41, line 1), or a positive photoresist may be applied, then exposed to electromagnetic radiation, from which portions of the photoresist within recesses are shielded (col. 18, lines 5-8; col. 35, lines 40-52),

with exposed and developed portions of the photoresist being subsequently washed away. Thus, Kikuchi neither expressly nor inherently describes “disposing” a material on a surface of a semiconductor device structure and within recesses thereof so as to substantially fill the recesses “without substantially covering [the] surface.”

In view of the foregoing, it is respectfully requested that the 35 U.S.C. § 102(e) rejections of claims 1, 2, 8, 9, 11, 16, and 17 be withdrawn.

Rejections Under 35 U.S.C. § 103(a)

Claims 3-7, 10, and 12-15 stand rejected under 35 U.S.C. § 103(a).

The standard for establishing and maintaining a rejection under 35 U.S.C. § 103(a) is set forth in M.P.E.P. § 706.02(j), which provides:

To establish a *prima facie* case of obviousness, three basic criteria must be met. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or combine reference teachings. Second, there must be a reasonable expectation of success. Finally, the prior art reference (or references when combined) must teach or suggest all the claim limitations. The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art, and not based on applicant's disclosure. *In re Vaeck*, 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991).

Kikuchi in View of Yoshihara

Claims 3-7 stand rejected under 35 U.S.C. § 103(a) for reciting subject matter which is assertedly unpatentable over that taught in U.S. Patent 6,278,153 to Kikuchi et al., in view of teachings from U.S. Patent 6,117,486 to Yoshihara.

Yoshihara teaches that by spinning a semiconductor wafer at high speeds (“as low as 2000 rpm”; col. 11, line 16), lowering the speed for a time, and re-increasing it to high speeds, the wafer can be coated with material in such a way that the material layer has a substantially uniform thickness. The phrase “uniform thickness” should not be confused with a “substantially planar” upper surface.

It is respectfully submitted that claims 3-7 are allowable, among other reasons, for depending either directly or indirectly from claim 1, which is itself allowable.

Moreover, without improperly relying upon the hindsight provided by the disclosure and claims of the above-referenced application, neither Kikuchi, Yoshihara, nor the knowledge available to one ordinarily skilled in the art before the above-referenced application was filed would have motivated one of ordinary skill in the art to combine teachings from Kikuchi with teachings from Yoshihara to arrive at the subject matter to which claims 3-7 are drawn. Kikuchi teaches that layers of resist may be spin-coated onto semiconductor substrates that include recesses. However, Kikuchi neither teaches nor suggests that resist layers so formed have substantially planar surfaces, at least over or within the recesses of such semiconductor substrates. Yoshihara teaches that by spinning a semiconductor wafer at high speeds (“as low as 2000 rpm”; col. 11, line 16), lowering the speed for a time, and re-increasing it to high speeds, the wafer can be coated with material in such a way that the material layer has a substantially *uniform thickness*. It is clearly not possible for a layer which is formed over a nonplanar surface and which has a substantially uniform thickness to have a substantially planar surface. It is, therefore, respectfully submitted that Yoshihara does not supply the motivation, suggestion, or teaching missing from Kikuchi that the techniques described in Kikuchi or Yoshihara are useful for disposing material within recesses such that the upper surface of at least the material within or over the recesses has a substantially planar upper surface.

It is also respectfully submitted that the asserted combination of teachings from Kikuchi and Yoshihara does not teach or suggest each and every element of claim 5. In particular, neither Kikuchi nor Yoshihara teaches or suggests initially spinning a semiconductor device structure at a rate of about 1,000 rpm, as recited in claim 5. Instead, the initial spin rate taught by Yoshihara is “as low as 2000 rpm . . .,” which is more than twice as high as the initial rate recited in claim 5. Col. 11, line 16.

In view of the foregoing, it is respectfully submitted that a *prima facie* case of obviousness has not been established against any of claims 3-7. It is, therefore, respectfully submitted that, under 35 U.S.C. § 103(a), each of claims 3-7 is allowable over the asserted combination of Kikuchi with Yoshihara.

Kikuchi in View of Lin

Claim 10 stands rejected under 35 U.S.C. § 103(a) for reciting subject matter which is assertedly unpatentable over that taught in U.S. Patent 6,278,153 to Kikuchi et al., in view of teachings from U.S. Patent 6,046,083 to Lin et al.

It is respectfully submitted that claim 10 is allowable, among other reasons, as depending from claim 1, which is allowable.

Kikuchi in View of Park

Claims 12 through 15 stand rejected under 35 U.S.C. § 103(a) for reciting subject matter which is assertedly unpatentable over that taught in U.S. Patent 6,278,153 to Kikuchi et al., in view of teachings from U.S. Patent 6,326,282 to Park et al.

It is respectfully submitted that claims 12-15 are allowable, among other reasons, as depending either directly or indirectly from claim 1, which is allowable.

For these reasons, withdrawal of the 35 U.S.C. § 103(a) rejections of claims 3-7, 10, and 12-15 is respectfully requested.

Election of Species Requirement

It is respectfully submitted that since independent claim 1 remains generic to all of the species of invention that have been identified by the Office, claims 18-88 should be brought back into consideration in the above-referenced application and allowed for the reasons that have been provided herein.

CONCLUSION

It is respectfully submitted that each of claims 1-88 is allowable. An early notice of the allowability of each of these claims is respectfully solicited, as is an indication that the above-referenced application has been passed for issuance. If any issues preventing allowance of

the above-referenced application remain which might be resolved by way of a telephone conference, the Office is kindly invited to contact the undersigned attorney.

Respectfully submitted,



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